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(71)Applicant : NGK INSULATORS LTD

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(72)Inventor : KATO SHIGEKI

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(54) HONEYCOMB MOLDING PRODUCT AND METHOD FOR PRODUCING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a honeycomb molding product mass-producible without impairing qualities of product, having thin thickness of partition and to provide a method for producing the same.

SOLUTION: This honeycomb molding product is obtained by extrusion molding a mixture of raw material powder and a molding binder. The honeycomb molding product contains no open pores and the molding binder is constituted of a thermoplastic material in a molten state at a molding temperature. This method for producing the honeycomb molding product comprises heating the mixture of the raw material powder and the molding binder to the molding temperature, melting the molding binder, extrusion molding the mixture and cooling and solidifying the molded material.

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**CLAIMS**

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[Claim(s)]

- [Claim 1] The honeycomb Plastic solid which is a honeycomb Plastic solid which carries out extrusion molding of the mixture of raw material powder and a shaping binder, and changes, and does not have an open pore, but is characterized by consisting of the thermoplastics this whose shaping binder is in a melting condition in molding temperature.
- [Claim 2] The honeycomb Plastic solid according to claim 1 this whose shaping binder is nonaqueous solubility.
- [Claim 3] The honeycomb Plastic solid according to claim 2 this whose shaping binder is a wax.
- [Claim 4] The honeycomb Plastic solid according to claim 2 this whose shaping binder is thermoplastics.
- [Claim 5] The honeycomb Plastic solid according to claim 2 this whose shaping binder is the mixture of a wax and thermoplastics.
- [Claim 6] The honeycomb Plastic solid according to claim 5 whose mixing ratio of the thermoplastics in this shaping binder is 35 - 80wt%.
- [Claim 7] The honeycomb Plastic solid according to claim 5 whose mixing ratio of the thermoplastics in this shaping binder is 40 - 70wt%.
- [Claim 8] The honeycomb Plastic solid according to claim 5 whose mixing ratio of the thermoplastics in this shaping binder is 45 - 60wt%.
- [Claim 9] A honeycomb Plastic solid given in any 1 term of claims 1-8 these whose raw material powder is ceramic powder.
- [Claim 10] The honeycomb Plastic solid according to claim 9 this whose raw material powder is cordierite.
- [Claim 11] A honeycomb Plastic solid given in any 1 term of claims 1-8 these whose raw material powder is metal powder.
- [Claim 12] A honeycomb Plastic solid given in any 1 term of claims 1-11 whose thickness of a septum is 25-100 micrometers.
- [Claim 13] A honeycomb Plastic solid given in any 1 term of claims 1-12 used as catalyst support for automobile exhaust purification.
- [Claim 14] The manufacture approach of the honeycomb Plastic solid which is the manufacture approach of a honeycomb Plastic solid given in any 1 term of claims 1-13 which carry out extrusion molding of the mixture of raw material powder and a shaping binder, and is characterized by carrying out extrusion molding and subsequently carrying out cooling solidification of the moldings after heating this mixture to molding temperature and carrying out melting of this shaping binder.
- [Claim 15] The manufacture approach of a honeycomb Plastic solid according to claim 14 that extrusion molding is a continuation kneading extrusion method.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the honeycomb extrusion-molding object used as catalyst support for automobile exhaust purification etc., and its manufacture approach.

[0002]

[Description of the Prior Art] In recent years, it is in the inclination for emission control to be tightened up every year, from consideration of an environmental problem, and the emission-gas-purification catalyst is asked for improvement in the purification engine performance that it should correspond to this. On the other hand, from the field of engine development, orientation of low fuel consumption and a high increase in power is shown notably, and the emission-gas-purification catalyst is asked also for reduction of a pressure loss that it should correspond to such a situation.

[0003] Then, raising permeability and reducing a pressure loss by making thickness of the septum of a honeycomb structure object thin, in order to solve such a problem, moreover the emission-gas-purification catalyst itself was lightweight-ized, heat capacity was reduced, and the motion which raises the purification engine performance at the time of warming up has become strong. Specifically, the 2-mil article whose thickness of a septum it is 50 micrometers that the 6-mil article whose thickness of a septum is 150 micrometers had now is becoming in use conventionally. [ in use ] In addition, honeycomb structure means the structure which divided many cels with the septum.

[0004] Moreover, using what mixed raw material powder, such as ceramic powder and metal powder, with the binder etc., using the mouthpiece with which the grid-like slit was formed, a honeycomb structure object is fabricated by extrusion molding, and, subsequently is usually manufactured by drying and calcinating. Conventionally, as a binder used for extrusion molding of a honeycomb structure object, the water-soluble, thermosetting methyl cellulose system binder has been used.

[0005] However, since the width of face of the slit of the shape of a grid formed in the mouthpiece also becomes small with the formation of a thin wall of a septum, it is necessary to use for shaping of a honeycomb structure object the fluid high binder which can flow into such a mouthpiece promptly. Moreover, since the reinforcement of a moldings to the extent that it came out of the mouthpiece becomes small with the formation of a thin wall of a septum and it becomes easy to deform with one's weight, it is necessary to use the high binder of firmness which comes out of a mouthpiece and is solidified soon.

[0006] Therefore, a degree of hardness is high, using the plastic matter excellent in firmness, a honeycomb structure object is fabricated, or a degree of hardness is low and fabricating a honeycomb structure object using the plastic matter which is rich in a fluidity has been performed.

[0007]

[Problem(s) to be Solved by the Invention] However, since the plastic matter with a high degree of hardness was lacking in a fluidity, while it did not flow into the mouthpiece easily, and could not aim at improvement in productive efficiency and it piled up the count of shaping since compacting pressure became high, it had the problem of a mouthpiece having deformed or wearing out.

[0008] Moreover, when a plastic matter with a low degree of hardness is used, in order to give reinforcement to the moldings which came out of the mouthpiece, it is necessary to carry out heat gel solidification of the binder by dielectric drying. However, in order to perform conveyance to a dielectric drying machine, guessing an air current from the moldings bottom so that a moldings may not deform with its weight, the problem that the crack by desiccation arose was in the part of the moldings which an air current hits.

[0009] This invention is made in view of this situation, and the place made into the purpose is to offer the

honeycomb Plastic solid with the thin thickness of a septum which can mass-produce without spoiling product quality, and its manufacture approach.

[0010]

[Means for Solving the Problem] That is, according to this invention, it is the honeycomb Plastic solid which carries out extrusion molding of the mixture of raw material powder and a shaping binder, and changes, and it does not have an open pore but the honeycomb Plastic solid with which a shaping binder consists of the thermoplastics which is in a melting condition with molding temperature is offered.

[0011] In the above-mentioned honeycomb Plastic solid, as for a shaping binder, it is desirable that it is nonaqueous solubility, and it is desirable that they are a wax, thermoplastics, or such mixture. At this time, the mixing ratio of the thermoplastics in a shaping binder may be 35 - 80wt%, more preferably, still more preferably, it may be desirable that it is 45 - 60wt%, and the raw material powder to be used may be ceramic powder or metal powder, such as cordierite, 40 - 70wt%.

[0012] The above-mentioned honeycomb Plastic solid may be used as catalyst support for removing harmful matter and dust from automobile exhaust.

[0013] Moreover, according to this invention, it is the manufacture approach of the above-mentioned honeycomb Plastic solid which carries out extrusion molding of the mixture of raw material powder and a shaping binder, and after heating the above-mentioned mixture to molding temperature and carrying out melting of the shaping binder, the manufacture approach of the honeycomb Plastic solid which carries out extrusion molding and subsequently carries out cooling solidification of the moldings is offered.

[0014]

[Embodiment of the Invention] In this invention, although a honeycomb Plastic solid carries out extrusion molding of the mixture of raw material powder and a shaping binder and it is manufactured, the thermoplastics which is in a melting condition is used for a shaping binder with molding temperature. Although fused by applying heat, since it can change the viscosity of a shaping binder freely according to temperature conditions, by choosing proper temperature conditions, thermoplastics can acquire a desired fluidity, and it can mass-produce a honeycomb Plastic solid, without spoiling productive efficiency.

[0015] Moreover, since cooling solidification is carried out, before a moldings causes deformation by its weight by quenching immediately the moldings which came out of the mouthpiece with cold water, cold blast, etc., the fused thermoplastics can solidify a binder easily and can collateralize the firmness of a moldings.

[0016] In order to use the shaping binder of nonaqueous solubility in this invention, desiccation of a Plastic solid becomes unnecessary. In the case of extrusion molding using a water-soluble binder, the air bubbles in the mixture (henceforth raw material mixture) of raw material powder and a shaping binder must be removed by vacuum degassing, but since desiccation does not take place when the shaping binder of nonaqueous solubility is used to the hard soil produced by local desiccation in vacuum degassing causing blinding of a mouthpiece, the blinding of a mouthpiece cannot happen but productive efficiency can be raised also from this viewpoint. In addition, when the shaping binder of nonaqueous solubility is used, vacuum law evasion is not indispensable.

[0017] In this invention, as a shaping binder of nonaqueous solubility, it is specifically desirable to use a wax or thermoplastics, as a wax, paraffin wax, a micro crystallin wax, etc. are used suitably, and common thermoplastics, such as EVA, polyethylene, polystyrene, a liquid crystal polymer, and engineering plastics, is suitably used as thermoplastics. Moreover, in this invention, one sort may be used independently, and the aforementioned shaping binder may be combined two or more sorts, and may be used. Furthermore, assistants, such as a coupling agent, lubricant, and a dispersant, may be added and used for the above-mentioned shaping binder.

[0018] moreover, the mixing ratio of thermoplastics [ in / when using what mixed thermoplastics with the wax as the above-mentioned shaping binder in this invention / a shaping binder ] -- 35 - 80wt% -- it is desirable more preferably that it is 45 - 60wt% still more preferably 40 - 70wt%.

[0019] This is because the addition of the thermoplastics of a shaping binder has affected the firmness at the time of shaping and compacting pressure, the amount of expansion at the time of cleaning and baking, the yield of a crack, and the adhesive property with a horse chestnut. In addition, the above-mentioned shaping binder has the effectiveness which the amount of expansion and the amount of defects at the time of cleaning and baking reduce while the firmness at the time of shaping improves and compacting pressure rises as the addition of thermoplastics increases.

[0020] From the above thing, in the upper limit of the mixing ratio of the thermoplastics of a shaping binder, 80wt(s)% and since the rise of compacting pressure can be controlled maintaining firmness by carrying out

to 60wt% still more preferably 70wt% more preferably, wall thickness is thin, and a honeycomb Plastic solid with a large cel consistency can be suitably fabricated by this invention, without making the mouthpiece for extrusion molding transform. Moreover, if the mixing ratio of the thermoplastics of a shaping binder increases too much, by the rise of the temperature of a moldings, thermal stress will become large and handling nature will also worsen.

[0021] Moreover, in this invention, the amount of expansion at the time of cleaning and baking, the yield of a crack, and an adhesive property with a horse chestnut can be more preferably reduced for the minimum of the mixing ratio of the thermoplastics of a shaping binder by carrying out to 45wt% still more preferably 40wt% 35wt(s)%.

[0022] In this invention, although extrusion molding of the mixture of raw material powder and a shaping binder is carried out, the addition of the shaping binder in the above-mentioned mixture changes with classes of shaping binder to be used, and adds the amount which can acquire a desired fluidity.

[0023] In this invention, as raw material powder used for manufacture of a honeycomb Plastic solid, although ceramic powder or metal powder is used suitably, with ceramic powder, the powder of the ceramic which are nitrides, such as oxides, such as cordierite, an alumina, and a mullite, and silicon nitride, silicon carbide, aluminium nitride, can be used. Powder, such as Fe, Cr, nickel, and aluminum, can be used in metal powder.

[0024] In this invention, although a honeycomb Plastic solid is manufactured by extrusion molding, especially if it is the facility which can do heating and pressurization as a kneading facility, it will not be limited, but can use a common kneader, a pressurized kneader, a 2 shaft continuation kneading extruder, etc. Moreover, especially if the shaping equipment used by this invention can do heating and pressurization and has an extrusion function, it will not be limited, but a plunger type extruder, a kneading machine, an injection molding machine, a 1 shaft continuous extrusion machine, a 2 shaft continuation kneading machine, etc. can be used for it. Furthermore, in this invention, the 2 shaft continuation kneading extruder as for which kneading and shaping are made to coincidence can also perform kneading and shaping to coincidence at once. In continuous molding, although the atomization of a binder is needed, as the atomization approach, a spray dryer and frost shattering are applicable, for example. Moreover, there is especially no limit in the heating means of shaping equipment, for example, you may heat at a heater, and may heat by thermal circulation using an oil etc.

[0025] A honeycomb shaping binder is suitably selected by the cellular structure of a honeycomb. Since the shape-retaining reinforcement of a Plastic solid is needed, so that wall thickness becomes thin, and so that a cel consistency becomes small, the rate of the addition of thermoplastics to a wax will increase. although shaping by the wax independent of the case of 12 mils of wall thickness, and the cel consistency 300 cel / inch<sup>2</sup> is attained -- the case of 4-1 mil of wall thickness, the cel consistency 500 - the 1200 cels / inch<sup>2</sup> -- the inside of the mixed shaping binder of a wax and thermoplastics -- the mixing ratio of thermoplastics -- 35 - 80wt% -- desirable -- 40 - 70wt% -- the range of 45 - 60wt% is more preferably suitable. Naturally, a good honeycomb can be fabricated even thermoplastics 100wt%.

[0026] Although determined by the class of shaping binder chosen, the molding temperature of a honeycomb Plastic solid, i.e., the temperature at the time of shaping of the raw material mixture itself, is independent in a wax, or when mixing and using a wax and EVA, it becomes 60 degrees C - about 100 degrees C, for example. Moreover, in high-melting thermoplastics, with polyethylene, it becomes about 280 degrees C, and becomes about 350 degrees C by the liquid crystal polymer. It is more advantageous to use the binder of a low-melt point point, if handling and thermal stress of a Plastic solid are taken into consideration. In addition, it is necessary to make kneading and molding temperature into the temperature which does not degrade a binder. The viscosity of raw material mixture is determined by the process condition which consists of the class of binder chosen, an addition and molding temperature, and a pressure, and serves as range which can fabricate a honeycomb. The addition of a binder can be suitably set up according to the class of raw material powder.

[0027] In this invention, although deformation of a moldings is prevented by carrying out cooling solidification of the moldings which came out of the mouthpiece, there is especially no limit in the cooling approach, for example, approaches, such as water cooling by air cooling and the atomizer, can be used. Moreover, it may be made to fall underwater and you may quench a moldings. In addition, depending on molding temperature, especially compulsory cooling is unnecessary. Moreover, although a moldings is horizontally extruded from an extruding press machine, it goes caudad and you may make it usually extrude a moldings with a vertical mold making machine.

[0028] From a viewpoint which reduces the stress at the time of cooling, the small thing of the difference of



molding temperature and cooling temperature is desirable, and it is [ that cooling temperature should just be temperature which a shaping binder solidifies / a cooling rate ] good. [ of the later one ]

[0029] In this invention, especially a limit may not be in the cross-section configuration of the cel of a honeycomb Plastic solid, and you may be polygons, such as a triangle, a square, and a hexagon, a round shape, etc. Moreover, the consistencies of a cel may be 300 - 2000 cel / inch 2.

[0030] In a low-temperature field, baking of a Plastic solid is performed by choosing conditions without generating of a cel piece in consideration of the scattering curve of a shaping binder, and is performed in an elevated-temperature field by choosing the conditions which can give target properties, such as porosity and coefficient of thermal expansion. Moreover, cleaning and baking of a honeycomb Plastic solid should just choose an inert atmosphere and the vacuum middle class suitably among atmospheric air according to the class of raw material powder. For example, after degreasing in atmospheric air in the case of the cordierite powder which is oxide, it calcinates in atmospheric air and continuous furnaces, such as a single furnace or a tunnel, usually perform cleaning and baking to coincidence.

[0031] When using for the catalyst for automobile exhaust the honeycomb structure object manufactured as mentioned above, after forming a gamma alumina layer in a cel path internal surface and making noble-metals components, such as platinum which is a catalyst component, a rhodium, and vanadium, support in the pore of the gamma alumina layer, a catalyst can be burned at the temperature around 600 degrees C.

[0032]

[Example] Hereafter, although this invention is explained in more detail using an example, this invention is not restricted to these examples.

[0033] (Examples 1-6) Cordierite powder is used as raw material powder, a wax is used as a shaping binder, it has a circular end-face configuration, and the honeycomb Plastic solid whose cross-section configuration of a cel is a square was manufactured. The cel consistency of a honeycomb Plastic solid and thickness of a septum were made into the value shown in Table 2.

[0034] First, the shaping binder of 100 micrometers of mean diameters was added, it supplied to continuation kneading extrusion-molding equipment, and kneading and shaping were performed to cordierite powder so that the content of the shaping binder in 100 % of the weight of raw material mixture might become 22 % of the weight. In addition, molding temperature selected 60 degrees C in consideration of the structure of an ingredient and a cel etc. The weight composition ratio of a shaping binder was taken as paraffin wax (NIPPON SEIRO CO., LTD. make) 90, the micro crystallin wax (NIPPON SEIRO CO., LTD. make) 6, and oleic acid (the Katayama chemistry incorporated company make) 4.

[0035] Next, the Plastic solid which came out of the mouthpiece was cooled by radiationnal cooling. About the acquired honeycomb Plastic solid, the perfect circle nature of a cel configuration and an outer diameter was investigated visually. A result is shown in Table 2. Next, the above-mentioned Plastic solid was calcinated at 1430 degrees C for 3 hours, and the honeycomb structure object was acquired.

[0036] (Examples 7-12) If the point which adopted 75 degrees C as having used the shaping binder which mixed EVA with the wax by the weight ratio 1:1, and a molding temperature was removed, the same honeycomb Plastic solid as examples 1-6 was manufactured by the same approach as examples 1-6. The weight composition ratio of a shaping binder was taken as paraffin wax (NIPPON SEIRO CO., LTD. make) 45, the micro crystallin wax (NIPPON SEIRO CO., LTD. make) 3, EVA (made in Mitsui E. I. du Pont de Nemours Chemical, Inc.)48, and oleic acid (the Katayama chemistry incorporated company make) 4. The cel consistency of a honeycomb Plastic solid and thickness of a septum were made into the value shown in Table 2. Moreover, the viscosity of a shaping binder was measured with the flow tester. The Measuring condition made 60 degrees C, 65 degrees C, 70 degrees C, 75 degrees C, and the diameter of a capillary to 1mm, and made the load 100 and 200 kgf/cm2 for temperature. A result is shown in Table 1. About the acquired honeycomb Plastic solid, the perfect circle nature of a cel configuration and an outer diameter was investigated like examples 1-6. A result is shown in Table 2. Next, the above-mentioned Plastic solid was calcinated on the same conditions as examples 1-6, and the honeycomb structure object was acquired.

[0037]

[Table 1]

温度 (℃)	粘度(d P a · s)	
	981×10 <sup>4</sup> Pa	1961×10 <sup>4</sup> Pa
60	流動せず。	47000
65	20000	3400
70	7400	1800
75	4000	1400

[0038] (Examples 13-18) If the point which adopted 110 degrees C as having used EVA as a shaping binder and a molding temperature was removed, the same honeycomb Plastic solid as examples 1-6 was manufactured by the same approach as examples 1-6. The weight composition ratio of a shaping binder was taken as EVA (made in Mitsui E. I. du Pont de Nemours Chemical, Inc.)100, and oleic acid (the Katayama chemistry incorporated company make) 5. The cel consistency of a honeycomb Plastic solid and thickness of a septum were made into the value shown in Table 2. About the acquired honeycomb Plastic solid, the perfect circle nature of a cel configuration and an outer diameter was investigated like examples 1-6. A result is shown in Table 2. Next, the above-mentioned Plastic solid was calcinated on the same conditions as examples 1-6, and the honeycomb structure object was acquired.

[0039] (Examples 1-6 of a comparison) Cordierite powder is used as raw material powder, methyl cellulose (the Shin-etsu chemistry incorporated company make) is used as a shaping binder, it has a circular end-face configuration, and the honeycomb Plastic solid whose cross-section configuration of a cel is a square was manufactured. The cel consistency of a honeycomb Plastic solid and thickness of a septum were made into the value shown in Table 2.

[0040] First, 7% of the weight, the content of the shaping binder in 100 % of the weight of raw material mixture added a shaping binder and water, supplied to continuation kneading extrusion-molding equipment, and performed kneading and shaping to cordierite powder so that the content of water might become 30 % of the weight. Molding temperature was made into 20 degrees C.

[0041] Next, the moldings which came out of the mouthpiece was dried. About the acquired honeycomb Plastic solid, the perfect circle nature of a cel configuration and an outer diameter was investigated like examples 1-6. A result is shown in Table 2. Next, the above-mentioned Plastic solid was calcinated on the same conditions as examples 1-6, and the honeycomb structure object was acquired.

[0042]

[Table 2]

	隔壁厚 (ミル)	セル密度 (セル/インチ <sup>2</sup> )	成形バインダー	セル形状	外径の真円性
実施例 1	1 2	3 0 0	ワックス	変形無し	変形無し
実施例 2	4	9 0 0	同上	変形無し	変形無し
実施例 3	2	4 0 0	同上	変形大	変形大
実施例 4	2	9 0 0	同上	中程度の変形	中程度の変形
実施例 5	2	1 2 0 0	同上	やや変形	やや変形
実施例 6	1	9 0 0	同上	変形大	変形大
実施例 7	1 2	3 0 0	ワックスとEVA の1:1混合物	変形無し	変形無し
実施例 8	4	9 0 0	同上	変形無し	変形無し
実施例 9	2	4 0 0	同上	変形無し	変形無し
実施例 10	2	9 0 0	同上	変形無し	変形無し
実施例 11	2	1 2 0 0	同上	変形無し	変形無し
実施例 12	1	9 0 0	同上	やや変形	やや変形
実施例 13	1 2	3 0 0	EVA	変形無し	変形無し
実施例 14	4	9 0 0	同上	変形無し	変形無し
実施例 15	2	4 0 0	同上	変形無し	変形無し
実施例 16	2	9 0 0	同上	変形無し	変形無し
実施例 17	2	1 2 0 0	同上	変形無し	変形無し
実施例 18	1	9 0 0	同上	変形無し	変形無し
比較例 1	1 2	3 0 0	水系のメチルセル ローズ	変形無し	変形無し
比較例 2	4	9 0 0	同上	変形無し	変形無し
比較例 3	2	4 0 0	同上	変形大	変形大
比較例 4	2	9 0 0	同上	中程度の変形	中程度の変形
比較例 5	2	1 2 0 0	同上	やや変形	やや変形
比較例 6	1	9 0 0	同上	変形大	変形大

[0043] In an example, unlike the example of a comparison, a desiccation process is not established, but although there are few routing counters in a production process, to the example of a comparison, or Table 2 shows that the honeycomb Plastic solid which has the dimensional accuracy beyond it was able to be manufactured. Moreover, the coefficient of thermal expansion and the rate of an open pore of a honeycomb sintered compact were not accepted for the difference in the example and the example of a comparison.

[0044] (Examples 19-25, example 7 of a comparison) Cordierite powder is used as raw material powder, a wax is used as a shaping binder, it has a circular end-face configuration, and the honeycomb Plastic solid whose cross-section configuration of a cel is a square was manufactured. The cel consistency was [ 600 cels / inch 2, and the wall thickness of the above-mentioned honeycomb Plastic solid ] 2.0 mils.

[0045] First, to cordierite powder, the shaping binder of 100 micrometers of mean diameters was added, heating kneading was carried out with the pressurized kneader with a welding pressure of  $1.0 \times 10^5$  Pa, it cracked with the jaw crusher after cooling, and the honeycomb Plastic solid was fabricated with the molding temperature and compacting pressure which are shown in Table 3 with the 1 shaft extruding press machine, respectively so that the content of the shaping binder in 100 % of the weight of raw material mixture might become 22 % of the weight. In addition, the above-mentioned shaping binder is the mixture of a wax and EVA (made in Mitsui E. I. du Pont de Nemours Chemical, Inc.), and what was mixed with the EVA addition as shown in Table 3 was used for it. Moreover, the weight composition ratio of the above-mentioned wax was taken as paraffin wax (NIPPON SEIRO CO., LTD. make) 90, the micro crystallin wax (NIPPON SEIRO CO., LTD. make) 6, and oleic acid (the Katayama chemistry incorporated company make) 4.

[0046] Next, after cooling the Plastic solid which came out of the mouthpiece by radiational cooling, the acquired honeycomb Plastic solid was evaluated, respectively. The result is shown in Table 3.

[0047]

[Table 3]



	成 形			
	EVA 添加量 (wt%)	成形温度 (℃)	成形圧力 (10 <sup>4</sup> × Pa)	成形結果
実施例19	3 5	6 4	6 8 6	良好
実施例20	4 0	7 0	9 8 1	良好
実施例21	4 5	7 2	1 0 7 9	良好
実施例22	5 0	7 5	1 1 7 7	良好
実施例23	6 0	8 3	1 5 6 9	良好
実施例24	7 0	9 2	1 9 6 1	温度が高く ハンドリング性がやや劣る
実施例25	8 0	1 0 0	2 3 5 4	口金に若干 の変形が見 られた
比較例 7	2 5	6 0	4 9 0	セル変形

[0048] Furthermore, after carrying out in 100 degrees C [ h ] /to 50 degrees C [ h ] /and 500-1200 degrees C and carrying out the temperature up of the above-mentioned honeycomb Plastic solid in 50 degrees C/h to 1200-1430 degrees C to room temperature -500 degree C, by holding at 1430 degrees C for 3 hours, cleaning and baking were performed and the honeycomb structure object was acquired, respectively. The acquired honeycomb structure object performed adhesive evaluation with an expansion coefficient, a baking crack, and a horse chestnut. The result is shown in Table 4.

[0049]

[Table 4]

	脱脂・焼成		
	膨脹率 (%)	焼成割れ	板との接着性
実施例19	2. 6	内部に微少欠陥	有り
実施例20	2. 4	微少欠陥	やや接着
実施例21	2. 2	良好	なし
実施例22	2. 0	良好	なし
実施例23	1. 6	良好	なし
実施例24	1. 2	良好	なし
実施例25	0. 8	良好	なし
比較例 7	3. 0	表面、内部にクラック	有り

[0050] Since the rise of compacting pressure was controlled maintaining firmness from the result of Table 3 at the time of shaping when examples 19-25 make the mixing ratio of the thermoplastics of a shaping binder 35 - 80wt% of within the limits, wall thickness was thin and was able to fabricate suitably the honeycomb Plastic solid with a large cel consistency. Moreover, examples 19-25 were able to reduce the amount of expansion at the time of cleaning and baking, the yield of a crack, and the adhesive property with a horse chestnut from the result of Table 4.

[0051]

[Effect of the Invention] It can mass-produce efficiently, without according to this invention, producing a crack for the honeycomb Plastic solid which has a thin septum of 25-100 micrometers, or making the mouthpiece for extrusion molding transform. Moreover, in this invention, since the blinding of the mouthpiece resulting from vacuum degassing can be lost and degreasing becomes still easier while desiccation of a Plastic solid becomes unnecessary by using the shaping binder of nonaqueous solubility, it can \*\* to improvement in productive efficiency further.

[Translation done.]